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JUNE 1991

1985 FIELD STUDIES ON PINNIPEDS AT SAN CLEMENTE ISLAND

By

Charles W. Oliver and Jeanne B. Wexler

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ADMINISTRATIVE REPORT LJ-91-24

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INTRODUCTION

Pinniped research has been conducted at San Clemente Island by Southwest Fisheries Science Center (SWFSC) personnel since July of 1981. San Clemente Island is one of four islands in the Southern California Bight (SCB) where California sea lion (Zalophus californianus) and northern elephant seal (Mirounga angustirostris) rookeries exist (Seagars et al., 1985). Harbor seals (Phoca vitulina richardsi) also breed at San Clemente Island and other islands within the SCB (Stewart and Yochem, 1985). Research conducted at San Clemente Island has been directed toward monitoring island population trends of these three species of pinnipeds.

In this report, we present results on seasonal distribution and numbers of pinnipeds, California sea lion food habits, salvage of dead marine mammals, data obtained from tagged sea lions and elephant seals, disturbance factors, and cetacean sightings for the period January through December 1985. This report is one in a series of reports on SWFSC research conducted at San Clemente Island (Oliver and Lowry, 1987, Oliver et al., 1988, Wexler and Oliver, 1988, Lowry et al., 1990).

STUDY AREA

San Clemente Island is the third largest and southernmost United States-owned island in the SCB. It is administered by the Department of the Navy, Naval Air Station at North Island, San Diego, California, and is used primarily for military operations. Our principal study area is located on the southwest side of San Clemente Island from Seal Cove Point to an area we named "the Shack", a linear distance of approximately 7.5 km (Figure 1). We divided this area into three distinct sub-areas: 1) north of Mail Point, 2) Mail Point, and 3) south of Mail Point (Figure 2). Data were also collected, but less often, between the Shack and

Lost Point, a linear distance of approximately 3.5 km. This area is adjacent and to the south of the principal study area (Figure 1). Two aerial surveys were made around the island during April and May to note distribution outside the study area.

METHODS

Counts and Distribution of Pinnipeds

We conducted five ground surveys within the principal study area during 1985. We censused sea lions and elephant seals over a two-day period. Counts were made from Seal Cove Point to Mail Point on one day, and continued from Mail Point to Arch Rock the next day. We were able to obtain complete counts of sea lions and elephant seals during those trips which included observations from atop Mail Point. From there animals could be surveyed below the Flat Area and on the southwest, northwest and north sides of Mail Point. If we did not ascend Mail Point, counts were considered incomplete, although we made efforts to estimate numbers of animals at these areas from other locations. We censused pinnipeds using 9x30 or 10x50 binoculars while remaining concealed behind terrain features. We were able to approach most animals to within 50 meters, and often much closer, without disturbing them. Animals in some areas, primarily the islands below Seal Cove Point and offshore of Tiki Head Beach (Figure 2), were censused at much greater distances. Data were recorded on field maps converted from aerial photographs of the coastline as we have previously described (Oliver et al., 1988). We made counts of harbor seals at the Shack, a haulout approximately 1 km south of Arch Rock (Figure 2). These counts were usually performed two days after sea lions and elephant seals had been censused and were obtained from a distance of approximately 100 meters using binoculars.

We categorized as many animals as possible according to age and sex. Sea lions and harbor seals were counted as either pups-of-the-year or non-pups. Pups of 1984 were animals born during the summer of 1984 and counted as 1984-pups through June of 1985. Thereafter, 1984-cohort pups were included in counts as non-pups. We counted 1985-cohort pups beginning with our observations of live pups in June, 1985. Non-pups consisted of adults, subadult males, juveniles and yearlings. Elephant seals were classified as adults, subadults, yearlings, weaned pups or unweaned pups. Complete counts within the principal study area were obtained during the March, August, and September trips.

The airspace around San Clemente Island is controlled by the U.S. Navy and attempts at conducting low-level surveys of the island were coordinated with them on the day of each survey. Based on past experience, we found that we were able to survey the entire island during our morning flights. Our aerial survey team consisted of a pilot and two observers. Surveys were flown in a Cessna 337 (Skymaster) offshore between 50-200 meters at an

altitude of 61 meters and a ground speed of 90-100 knots. Times, locations, estimates of pinniped group sizes and comments were recorded on tape. Locations were recorded when the aircraft was abeam of sightings. Location was determined with a Texas Instrument 9100 Loran-C Navigational unit. Two aerial, shoreline surveys of the island were flown on April 29 and May 28 to locate pinnipeds outside the principal study area and estimate their numbers. We also recorded estimates of numbers within the principal study area during aerial surveys.

California Sea Lion Food Habits Study

We collected scats at all three sea lion haulout areas: 1) north of Mail Point; 2) Mail Point; and 3) south of Mail Point (Figure 2). South of Mail Point collections accounted for most of our samples. We collected samples after the animals had left their haulouts. During the collection of fresh and dry scats, the haulout areas were cleared of all uncollected scats. Clearing areas during each trip defined a time frame for scats found on the next trip. Scats were individually bagged and labeled, and subsequently stored in a freezer upon our return from the island. Laboratory procedures and analyses of the scat samples are described in Lowry et al. (1990).

Salvage of Dead Marine Mammals

When physically possible, we salvaged dead marine mammals at all haul-out areas and during beach surveys from Lost Point to the Shack. Since salvage efforts were generally conducted while censusing an area and looking for tagged animals and scats, we were only able to salvage animals from areas where animals were not hauled out. To reduce the amount of disturbance to animals, we generally did not examine dead animals in most of the Mail Point area, nor on the beaches below the Uppers to south of Mail Point (Figure 2). We noted all dead animals at these locations, whether or not we salvaged the carcass. All salvaged marine mammal carcasses were marked with red surveyor's tape so that carcasses would not be mistaken for recent strandings during subsequent trips. Specimen parts were collected from dead sea lion pups and any tagged pinnipeds for further analysis. Foreflippers from freshly dead pups and tagged animals were collected for osteological studies of age determination. Teeth were also collected for age determination. All specimen parts were stored at the SWFSC. Pinniped salvage data were recorded on a pinniped life history data form and entered into the SWFSC database PINNLIFE.DAT.

Tagging and Resights of Tagged Pinnipeds

We tagged northern elephant seals under the authority of Marine Mammal Protection Act Permit 404 in March at Mail Point. Pups

were tagged with white Reise tags in the inter-digit webbing closest to the outer edge of each rear flipper. Non-pups were tagged, without chemical or physical restraint, while animals were resting and generally resulted in only a single tag being placed on a rear flipper. Data on the age, sex, location, tag number and color, and physical condition of each animal were recorded in addition to tooth eruption and molt condition for weaned pups. We tagged California sea lions under the authority of Marine Mammal Protection Act Permit 347 in September, approximately two to three months after the onset of the breeding season. All tagging occurred in the Mail Point area where pups were most accessible and abundant. Personnel stalked small groups or herded larger groups against the sides of rocky cliffs at the North Face and Big Pool areas of Mail Point (Oliver et al., 1988). Animals were then captured with hoop nets. After capture, pups were weighed, sexed and tagged. Tags were placed on the inside rear edge of each fore-flipper close to the body. Data on the sex, location, tag number and color, pup weight, and general physical condition were recorded for each animal. We recorded tag information on coding forms and entered these data into the SWFSC database STAGDB.DAT (Wexler 1985).

We obtained the tag numbers of previously tagged pinnipeds during each census using 9x30 binoculars, 10x50 binoculars, and 20x45 spotting scopes. Tag number, color, condition of tag, location of tag (left, right or both flippers) and animal age class, condition, association and behavior were recorded, and subsequently coded and entered into the SWFSC database STAGDB.DAT.

RESULTS

Counts and Distribution of Pinnipeds

The numbers of California sea lion pups and non-pups we censused during 1985 are presented for each sub-area (NMP, MP, SMP) within the principal study area in Table 1 and Figures 3-4. The number of sea lions observed during ground counts within the principal study area fluctuated throughout 1985. We observed 115 pups of the 1985 cohort on June 7-8 and 609 live pups during our August 2-3 census. Pups from both the 1984 and 1985 cohorts were most abundant in the Mail Point area throughout the year (50-75%), followed by the NMP area (15-30%), and the SMP area (5-25%). On every trip, the MP area accounted for the greatest number of animals. During the months of June-August we noted an increase in the number of non-pups in the SMP area primarily comprised of juveniles and sub-adult males, while concurrent increases in the MP and NMP areas were comprised of adult females and pups (Table 1, Figures 3-4). Although the NMP area is larger than either the MP or SMP areas, we only observed animals at Seal Cove Point and between the Small Cliffs and Tiki Head Bridge Beach (Figure 2) within the NMP area. We observed California sea lions outside the study area during two aerial surveys of the island's shoreline (Table 2, Figures 1-2). During the April 29 flight, six sea lions were observed on the eastern shoreline, and 55 were seen at the Northwest Harbor islet. During the May 28 flight, 2 were seen north of the study area near Eel Point, and 88 at the Northwest Harbor islet.

Very few northern elephant seals were seen at San Clemente Island during our five trips to the island in 1985 (Table 1). There were 21 animals at Mail Point, and another animal in the SMP area for a maximum count of 22 animals during our January 11-12 census. We did not see any pups in January. However, during the March 8-11 census we observed a total of five animals, two of which were weaned pups. We believe these two northern elephant seal pups were born on San Clemente Island. The age-class distribution of elephant seals is presented in Table 3. We did not observe any northern elephant seals outside of the study area during either of the two aerial surveys in April and May, but we estimated the number seen at Mail Point during these flights at 35 and 31 animals, respectively (Table 2).

Our aerial surveys and ground observations indicate that northern elephant seal breeding and hauling out at San Clemente Island occurs primarily at Mail Point within our study area. Elephant seals may occasionally haulout at other locations outside the principal study area (Wexler and Oliver, 1988), and there likely were greater numbers of animals at SCI between our early March and June trips. At least two pups were born on San Clemente Island during 1985.

We observed harbor seals within our study area at the Shack

(Figure 2) during four of the five trips (Table 1). We counted 4 harbor seal pups in March. The greatest number of harbor seals were seen during the June census when we counted 17 animals. We observed harbor seals outside the principal study area during both aerial flights (Table 2), primarily in a series of small coves along the southwest shoreline between Lost Point and China Point (Figure 1). We counted 32 animals on April 29, and 41 on May 28 in the area between Lost Point and China Point. We also observed harbor seals at the Northwest Harbor islet during the April flight (2 animals) and during the May flight (17 animals).

Our ground observations (Table 1) and aerial surveys of the island (Table 2) indicate that harbor seals consistently haul out at the Shack and at other areas outside the principal study area, primarily between Lost Point and China Point and at the Northwest Harbor islet.

California Sea Lion Food Habits Study

We collected 99 fresh and 17 dried California sea lions scats during 1985 (Table 4). Thirteen of these 116 scats were omitted from prey analysis due to procedural errors during laboratory processing. Laboratory procedures are described in Lowry et al., (1990) and all identifications and species percentages were made by Mark Lowry (SWFSC). Those positively identified otoliths, beaks, and other prey remains which were obtained from these 103 scats are included in the prey list shown in Table 5a. Those prey items not positively identified, and therefore "probable identifications", are listed in Table 5b. Lowry et al., (1990) describe in detail the results obtained from an analysis of scats collected at San Clemente Island during 1981-1986. Using their definition of "commonly occurring prey" as those prey with PFO's of 10% or more, we found six prey to commonly occur (PFO$\geq$ 10%) in the 103 scats collected at San Clemente Island during 1985. These are: 1) northern anchovy (Engraulis mordax), 72%; 2) Pacific whiting (Merluccius productus), 21%; 3) Market squid (Loligo opalescens), 17%; 4) rockfish (Sebastes spp.), 15%; 5) Jack mackerel (Trachurus symmetricus), 14%; and, 6) blacksmith (Chromis punctipinnis), 10% (Table 5a).

Salvage of Dead Marine Mammals

California sea lions were the only stranded pinniped observed and examined during the year (Table 6, Appendix 1). Dead strandings were found in the principal study area at Mail Point (80%) and outside the study area between Lost Point and the Shack (20%). We salvaged three dead animals during 1985 which had previously been tagged as pups on San Clemente Island during either 1983 or 1984 (Appendix 1). Three premature pups (1985-cohort) were salvaged during the March trip, the same number of premature pups salvaged during 1984. This may be further indication of reduced neonatal pup mortality during 1984 and 1985

compared to 1982 or 1983 when we salvaged 6-13 premature pups each year. We salvaged 14 adult female sea lions during the March trip, while in other years we had salvaged four or less animals, but were unable to establish the cause of death for these animals.

Tagging and Resights of Tagged Pinnipeds

Five northern elephant seals, 2 pups and 3 yearlings born at San Clemente Island, were either single or double-tagged with white Reise tag numbers 518-521 and 642 during 1985 (Appendix 2).

The general physical condition of sea lion pups tagged in September, 1985 was rated as good with only two of the 132 pups we examined having been rated either fair or poor. Open lesions were observed around the genital and anal areas, or on the ventral surfaces of the rear flippers, on 18.2% (24/132) of the pups captured and tagged during September 1985. These lesions, also observed during 1984, may have been associated with the San Miguel Island Virus (Smith et al., 1977).

We sexed and double-tagged 132 California sea lion pups of the 1985 cohort with white Reise tags numbered between 522 and 657 (Appendix 3). Twenty-three percent of the pups counted during the September trip were tagged (132/579). Sex ratios and mean weights of animals tagged are listed in Table 7, and data for individual animals are shown in Appendix 3. The sex ratio of 131 pups which we sexed and weighed did not deviate significantly ($X^2_{0.05,1} = 2.206$) from the expected 1:1 ratio (Table 7). We found

the sample variances for male and female pup weights to be unequal ($F_{0.05(2),73,56} = 2.392$, $P<0.002$) and used a means test

which allowed for unequal sample variances. The mean weight of 74 male pups (21.7kg) was significantly greater than the mean weight of 57 female pups (18.1kg) at San Clemente Island during September, 1985 ($t_{0.05(1),129} = 7.560$).

Both male and female mean weights obtained in 1985 were greater than we reported for the 1983 and 1984 cohorts (Wexler and Oliver, 1988). A two-way ANOVA for male and female weights obtained during 1982-1985 indicate significant differences for both year ($F_{0.05(3,510)} = 125.894$, $P<0.001$) and sex ($F_{0.05(1,510)}$

$= 78.715$, $P<0.001$) treatments. Because male weights were significantly greater than female weights during 1982-1984 (Wexler and Oliver, 1988) and again in 1985, we performed a one-way ANOVA on male and female weights separately, and used the Newman-Keuls multiple range test (Zar, 1974) to test for significant differences between years. Mean male weights were significantly different for all year combinations except 1982 versus 1985 ($q_{0.05}$). Male weights in 1982 and 1985 were

significantly greater than in other years. Mean female weights were significantly different for all year combinations except 1982 versus 1985 and 1983 versus 1984. ($q_{0.05}$). Mean female weights in 1983 and 1984 were not significantly different, but both years were significantly smaller than female weights in 1982 and 1985.

We recorded data on sightings of California sea lions and northern elephant seals which had previously been tagged at San Clemente Island using white Reise or roto tags. These data were collected during each trip and the total number of unique tag numbers resighted for each trip is shown in Table 8. The tag numbers from 107 California sea lions, which had previously been tagged at San Clemente Island during either 1983 or 1984, were obtained during 1985, although some of these were multiple sightings of the same animal. Two of these tag resights were obtained from dead animals we salvaged (Appendix 1) while the remainder were from live animals. We were unable to obtain the tag numbers for 5 white-tagged California sea lions. No tagged animals from the 1981 or 1982 cohorts were identified. We have not received any reports of animals tagged at San Clemente Island having been observed elsewhere during 1985.

A single northern elephant seal and a single California sea lion, tagged at areas other than San Clemente Island, were observed at San Clemente Island during 1985 (Table 9). A northern elephant seal yearling, seen on January 13, 1985 at Mail Point, bore red Reise tags on both rear flippers (tag number B170) indicating it had been tagged at San Nicolas Island. A California sea lion yearling was observed at Mail Point on June 7, 1985 with a blue Reise tag on its left fore-flipper (tag number 369), indicating it had been tagged at Santa Barbara Island.

Disturbance Factors

We continued to observe evidence of potential and actual disturbance to pinnipeds within our study area. Past observations and discussions with island personnel indicate the following activities commonly occur: 1) naval and marine personnel observing animals at the rookery and haulouts, 2) military aircraft flying over these areas at low altitudes, and 3) commercial and sport fishing vessels operating within 50-100 meters of rookery areas.

On June 7, 1985, we observed six sets of tire tracks leading to shoreline areas where California sea lions haulout on August 2, 1985. We observed Navy helicopters fly over Mail Point on March 9, March 10, June 7, and September 7, 1985 at altitudes as low as 100 feet. A Navy F14 buzzed Mail Point six times at less than 200 feet on August 3. On every trip we observed abalone, lobster, SCUBA diving, and sportfishing vessels operating within as little as 50 meters of hauled-out animals. On January 12, 1985, Wexler

observed an abalone fisherman fire three times in the vicinity of California sea lions hauled out at Mail Point, which caused over 200 of them to stampede into the water.

Cetaceans

No dead cetaceans were salvaged within the study area at San Clemente Island during 1985. We observed 14 gray whales within approximately one nautical mile or less of Mail Point on January 11-13 and 2 northbound gray whales on March 10. No other observations of cetaceans were made within, or offshore, of the study area.

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Table 1. Numbers and distribution of pinnipeds within the principal study area between the Shack and Seal Cove Point at San Clemente Island by data collection period for 1985. Data were obtained during ground counts only, and do not include aerial survey estimates.

Trip Period Date	Location[1]	CALIFORNIA SEA LION 1984 Pups	1985 Pups	1985 Non-pup	Total Number	NORTHERN ELEPHANT SEAL 1985 Pups	1985 Non-pup	HARBOR SEAL 1985 Pups	1985 Non-pup
January 11-14, 1985	SMP	0	0	1	1	0	1	0	9
	MP[2]	66	0	451	517	0	21	0	0
	NMP	40	0	152	192	0	0	0	0
	Totals[2]	106	0	604	710	0	22	0	9
March 8-11, 1985	SMP	47	0	104	151	0	0	4	11
	MP	118	0	416	534	2	3	0	0
	NMP	59	0	160	219	0	0	0	0
	Totals	224	0	680	904	2	3	4	11
June 7-10, 1985	SMP	35	8	307	350	0	1	6	17
	MP[2]	7	87	267	361	2	4	0	0
	NMP	12	20	162	194	0	0	0	0
	Totals[2]	54	115	736	905	2	5	0	17
August 2-5, 1985	SMP	-	94	231	325	0	0	0	4
	MP	-	392	334	726	0	0	0	0
	NMP	-	123	174	297	0	0	0	0
	Totals	-	609	739	1348	0	0	0	4
September 5-9, 1985	SMP	-	42	50	92	0	0	-No count -	
	MP	-	372	209	581	3	0	0	0
	NMP	-	165	81	246	0	0	0	0
	Totals	-	579	340	919	3	0	0	0

[1] SMP - "The Shack" to Mail Point (3.0 km of coastline).
MP - Mail Point area (0.5 km of coastline).
NMP - Mail Point to Seal Cove Point (4.0 km of coastline).
[2] Incomplete count for area or trip.

Table 2. Aerial survey sightings of hauled out pinnipeds at San Clemente Island during April and May, 1985.

Flight[1] Number	Marine[2] Mammal Species Code	Estimated Number of Animals	Sighting Number	Date	Local Time (Decimal Minute)	Location[3]	Position (Decimal Minute)
11	93	1	1.1	85/04/29	10 240		32 524 N 118 250 W
11	93	8	2.1	85/04/29	10 270		32 492 N 118 210 W
11	93	7	3.1	85/04/29	10 275		32 489 N 118 207 W
11	93	13	4.1	85/04/29	10 320		32 507 N 118 290 W
11	93	1	5.1	85/04/29	10 325		32 507 N 118 291 W
11	93	2	6.1	85/04/29	10 330		32 507 N 118 292 W
11	93	11	7.1	85/04/29	10 350	THE SHACK	32 525 N 118 305 W
11	91	350	8.1	85/04/29	10 355	SMP	32 529 N 118 306 W
11	91	6	8.2	85/04/29	10 357	SMP	32 530 N 118 309 W
11	91	450	8.3	85/04/29	10 360	MP	32 531 N 118 311 W
11	92	35	8.4	85/04/29	10 360	MP	32 531 N 118 311 W
11	91	30	9.1	85/04/29	10 395	NMP	32 542 N 118 317 W
11	91	30	10.1	85/04/29	10 397	NMP	32 544 N 118 322 W
11	91	17	11.1	85/04/29	10 398	NMP	32 544 N 118 322 W
11	93	2	12.1	85/04/29	10 478	NW HARBOR ISLET	33 023 N 148 351 W
11	91	55	12.2	85/04/29	10 478	NW HARBOR ISLET	33 023 N 118 351 W
11	91	5	13.1	85/04/29	10 510		32 579 N 118 313 W
11	91	1	14.1	85/04/29	10 521		32 563 N 118 301 W
12	93	2	1.1	85/05/28	9 590		32 479 N 118 210 W
12	93	1	2.1	85/05/28	10 000		32 476 N 118 216 W
12	93	24	3.1	85/05/28	10 047		32 487 N 118 283 W
12	93	14	4.1	85/05/28	10 050		32 491 N 118 287 W
12	93	6	5.1	85/05/28	10 071	THE SHACK	32 523 N 118 306 W
12	91	146	6.1	85/05/28	10 073	SMP	32 528 N 118 306 W
12	91	35	6.2	85/05/28	10 074	SMP	32 528 N 118 306 W
12	91	164	6.3	85/05/28	10 075	SMP	32 527 N 118 307 W
12	91	16	6.4	85/05/28	10 077	SMP	32 530 N 118 309 W
12	91	145	6.5	85/05/28	10 079	MP	32 531 N 118 311 W
12	92	31	6.6	85/05/28	10 079	MP	32 521 N 118 318 W
12	91	6	7.1	85/05/28	10 097	NMP	32 534 N 118 312 W
12	91	1	8.1	85/05/28	10 108	NMP	32 543 N 118 322 W
12	91	35	9.1	85/05/28	10 109	NMP	32 544 N 118 323 W
12	91	2	10.1	85/05/28	10 123		32 558 N 118 335 W
12	91	88	11.1	85/05/28	10 168	NW HARBOR ISLET	33 015 N 118 352 W
12	93	17	11.2	85/05/28	10 168	NW HARBOR ISLET	33 015 N 118 352 W

[1]Surveyed area: flights 11-12 surveyed the entire island.
[2]Species codes: 91-California sea lion; 92-Northern elephant seal; 93-Harbor seal
[3]Location: Within the study area; NMP-North of Mail Point; MP-Mail Point; SMP-South of Mail Point

Table 3. Observed age class distributions for northern elephant seals within the principal study area at San Clemente Island during each trip period for 1985

Trip Period Date	Adult		Subadult			Yearling	Weaned Pup	Weaned pup or yearling	Total
	M	F	M	F	?				
January 11-14, 1985	2	0	0	0	0	20	0	0	22
March 8-11, 1985	0	0	0	1	0	2	2	0	5
June 7-10, 1985	0	0	0	0	4	1	0	2	7
August 2-5, 1985	0	0	0	0	0	0	0	0	0
September 5-9, 1985	0	0	0	0	0	0	0	3	3

Table 4. Numbers of California sea lion scats collected within the principal study area at San Clemente Island during 1985.

Trip Period Date	Area of Collection[1]	NUMBER OF SCATS COLLECTED Fresh scats	Dry scats	Totals
January 11-14, 1985	SMP	0	16	16
March 8-11, 1985	SMP, MP	11	1	12
June 7-10, 1985	SMP	24	0	24
August 2-5, 1985	SMP, MP, NMP	38	0	38
September 5-9, 1985	MP	26	0	26
TOTALS		99	17	116

[1]SMP - "Arch Rock" to Mail Point (1.4 km of coastline)
MP - Mail Point Area (0.5 km of coastline)
NMP - Mail Point to Seal Cove Point (4.0 km of coastline)

Table 5a. Positively identified prey found in 103 California sea lion scats collected within the principal study area at San Clemente Island during 1985. Data are presented for the number and percent frequency of occurrence (PFO) from all samples in which a prey item was recovered.

PREY SPECIES		Numbers of Occurrences for Total Samples	PFO for Total Samples
Scientific Name	Common Name	N	%
Engraulis mordax	Northern anchovy	74	72
Merluccius productus	Pacific whiting	22	21
Loligo opalescens	Market squid	18	17
Sebastes spp.	Rockfish	15	15
Trachurus symmetricus	Jack mackerel	14	14
Chromis punctipinnis	Blacksmith	10	10
Pleuroncodes planipes	Pelagic red crab	8	8
Scomber japonicus	Pacific mackerel	3	3
[1]Unidentified cephalopod spp.	Squid and octopus	3	3
Onychoteuthis borealijaponicus	Squid	2	2
Paralabrax clathratus	Kelp bass	2	2
Zaniolepis sp.	Combfish	1	1
Lycodes (Aprodon) cortezianus	Bigfin eelpout	1	1
Ceratoscopelus townsendi	Dogtooth lampfish	1	1
TOTAL NUMBER OF OCCURRENCES		175	

[1] Unidentified species are not included in Table 5b.

Table 5b. Probable prey identifications found in 103 California sea lion scats collected within the principal study area at San Clemente Island during 1985. Data are presented for the number and percent frequency of occurrence (PFO) from all samples in which a prey item was recovered.

PREY SPECIES		Numbers of Occurrences for Total Samples	PFO for Total Samples
Scientific Name	Common Name	N	%
Trachurus symmetricus	Jack mackerel	1	1
Abraliopsis felis	Squid	1	1
Gonatus sp.	Squid	1	1
Cartilaginous fish vertebrae		1	1
TOTAL NUMBER OF OCCURRENCES		4	

Table 6. Summary of dead California sea lion strandings observed at San Clemente Island during 1985.

	SEAL COVE POINT TO THE SHACK			THE SHACK TO LOST POINT			TOTALS		
Trip Period Dates	1984 Pups	1985 Pups	Non-Pups	1984 Pups	1985 Pups	Non-Pups	1984 Pups	1985 Pups	Non-Pups
January 11-14,[1] 1985	1	0	2	1	0	0	2	0	2
March 8-11, 1985	4[3]	0	16[4]	1	0	5	5[3]	0	21[4]
June 7-10,[1,2] 1985	0	3[5]	1	NOT SURVEYED			0	3[5]	1
August 2-5, 1985	1	6	1	0	1	3	1	7	4
September 5-9, 1985	1	8[6]	0	NOT SURVEYED			1	8[6]	0
TOTALS	7	17	20	2	1	8	9	18	28

[1] Incomplete count for area or trip

[2] Pyramid Cove was surveyed on June 9, 1985 during which two California sea lion non-pups were salvaged, but not included in this table.

[3] Includes an animal tagged during September 1984 at SCI (tag # 474) and salvaged during 1985 at SCI.

[4] Includes an animal tagged during September 1983 at SCI (tag # 343) and salvaged during 1985 at SCI.

[5] These animals were categorized as premature pups.

[6] Includes an animal tagged on September 7, 1985 at SCI (tag # 526) and salvaged on September 8, 1985 at SCI.

Table 7. Numbers and mean weights (x) of California sea lions captured, sexed, weighed, and tagged at San Clemente Island during 1985.

Sex	Number of Tagged 1985 Pups	Mean Weight of 1985 Pups	SD
Males	74 (56%)	21.7 kg (N=74)	3.3
Females	58 (44%)	18.1 kg (N=57)	2.1
Both	132	20.1 kg (N=131)	3.4

Table 8. Unique resights of San Clemente Island-tagged California sea lions at San Clemente Island during 1985.

Date Resights Obtained	1983 Pups Tags Read	1983 Pups Tags Unread	1984 Pups Tags Read	1984 Pups Tags Unread
January 11-14, 1985	0	0	19[1]	3
March 8-11, 1985	6[2]	0	56[3]	0
June 7-10, 1985	0	1	7	1
August 2-5, 1985	2	0	9	0
September 5-9, 1985[4]	1	0	7	0

[1] A single tag was found (tag # 517), from an animal tagged during September 1984, but not associated with a carcass, and not included in this table.

[2] Includes an animal tagged during September 1983 at SCI (tag # 343) and salvaged during 1985 at SCI.

[3] Includes an animal tagged during September 1984 at SCI (tag # 474) and salvaged during 1985 at SCI.

[4] Does not include an animal tagged on September 7, 1985 at SCI (tag # 526) and salvaged on September 8, 1985 at SCI.

Table 9. Resights of live tagged pinnipeds, from other areas, observed within the study area at San Clemente Island during 1985

Tag Resight Date	Tag Number, Color, Type and Placement	Observed Age	Species	Area Where Animal Was Tagged
January 13, 1985	B170 Red Riese Left Rear Flipper B170 Red Reise Right Rear Flipper	Yearling (1984 Pup)	Mirounga angustirostris	San Nicolas Island
June 7, 1985	369 Blue Riese Left Foreflipper	Yearling (1984 Pup)	Zalophus californianus	Santa Barbara Island

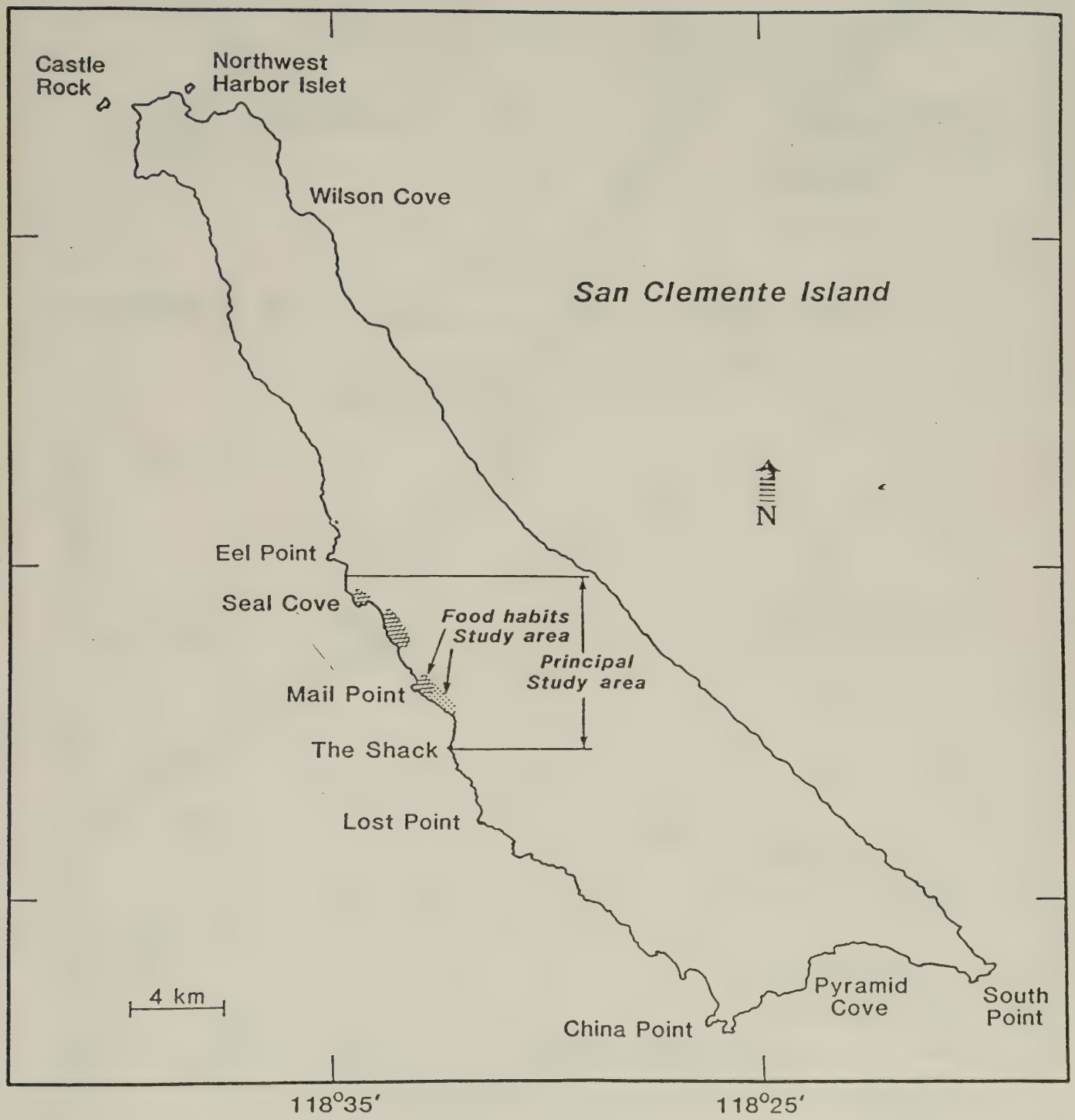

Figure 1. Map of San Clemente Island showing the study area. Observed breeding areas are indicated by crosshatch. Areas used primarily as haulouts are indicated with stipple.

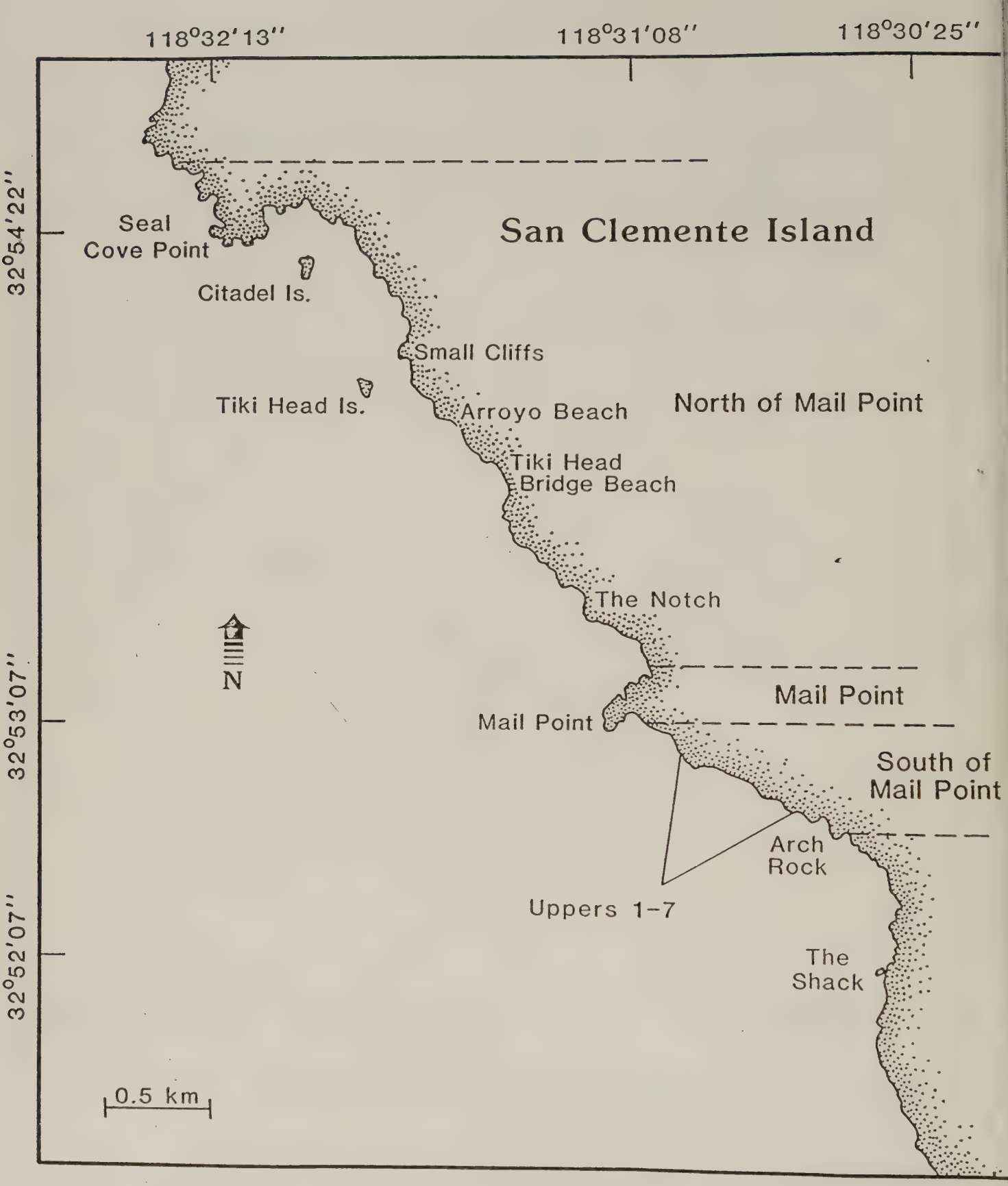

Figure 2. San Clemente Island study area showing the three sub-areas where pinnipeds were studied.

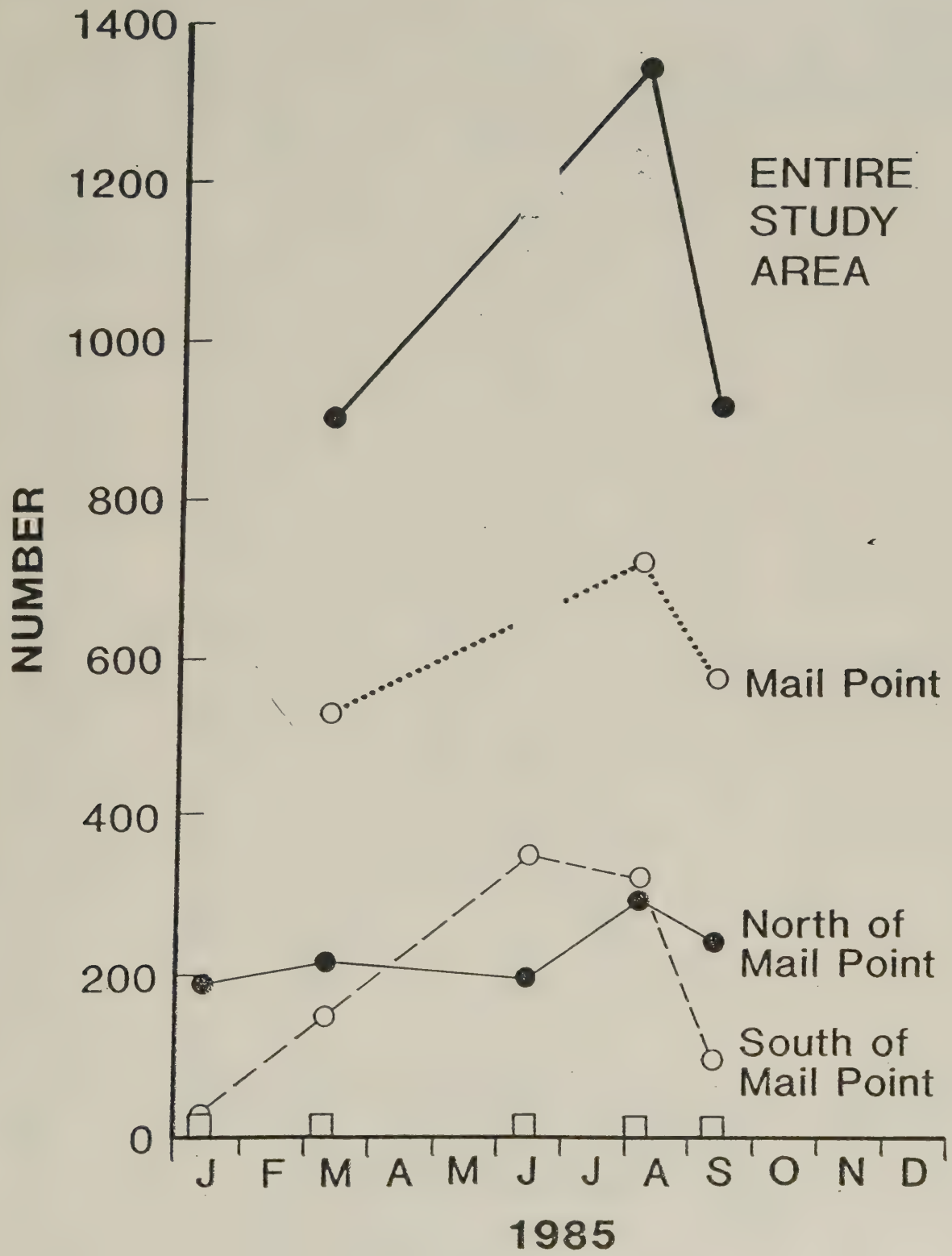

Figure 3. Numbers of California sea lions counted at San Clemente Island during 1985.

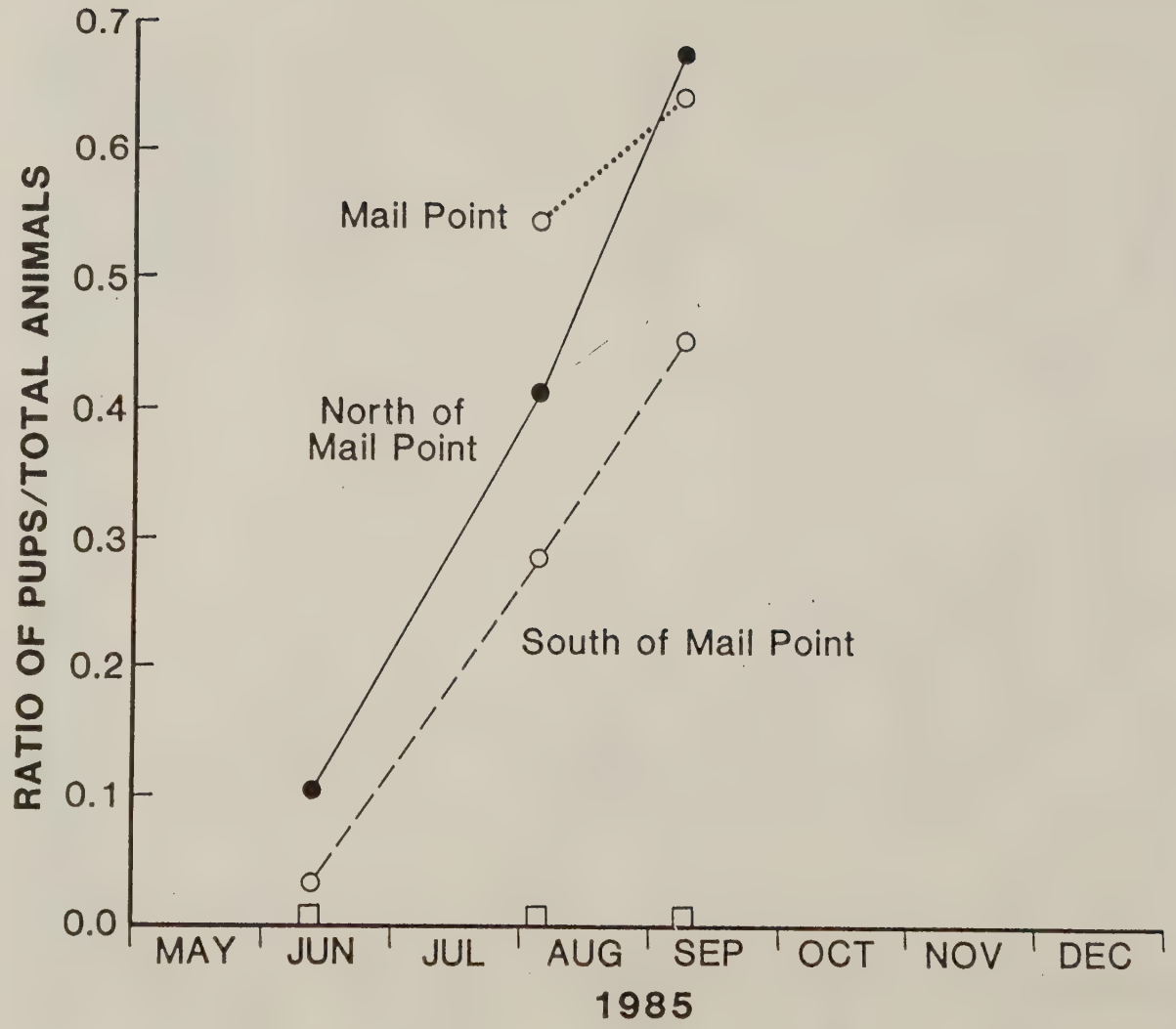

Figure 4. Ratios of California sea lion pup counts to total counts, by area, at San Clemente Island during 1985.

Appendix 1. Dead strandings of California sea lions salvaged on San Clemente Island during 1985.

DATE	SPECIMEN NUMBER	SPECIES[1]	LATITUDE	LONGITUDE	SEX[2]	AGE CLASS[3]	TAGS PRESENT	SPECIMEN PARTS COLLECTED TEETH ?	SPECIMEN PARTS COLLECTED SKULL ?
850111	JBW0075		32 53'43''N	118 31'25''W	U	P83			
850111	JBW0076		32 53'10''N	118 31'07''W	F	A			
850112	JBW0077		32 52'43''N	118 30'40''W	U	P84			
850113	JBW0078		32 51'30''N	118 30'00''W	U	P84			
850308	CW00928		32 52'51''N	118 30'36''W	F	A			
850308	CW00929		32 52'58''N	118 30'52''W	F	A			
850308	JBW0079		32 53'50''N	118 31'40''W	F	A			
850308	JBW0080		32 53'50''N	118 31'40''W	F	A			
850308	JBW0081		32 53'56''N	118 31'37''W	F	A			
850308	JBW0082		32 53'56''N	118 31'37''W	F	A			
850308	JBW0083		32 53'50''N	118 31'30''W	U	A			
850308	JBW0084		32 53'43''N	118 31'25''W	F	A			
850308	JBW0085		32 53'43''N	118 31'25''W	F	A			
850308	JBW0086		32 53'22''N	118 31'12''W	U	A			
850308	JBW0087		32 53'22''N	118 31'12''W	F	A			
850308	JBW0088		32 53'22''N	118 31'12''W	F	A			
850308	JBW0089		32 53'22''N	118 31'12''W	F	A			
850308	JBW0090		32 53'13''N	118 31'03''W	F	P84	YES	YES	
850308	JBW0091		32 53'13''N	118 31'03''W	U	A			
850309	CW00930		32 53'07''N	118 31'04''W	U	P84			
850309	CW00931		32 52'59''N	118 30'55''W	U	P83			
850309	JBW0092		32 52'59''N	118 30'55''W	M	P83	YES	YES	
850309	JBW0093		32 53'07''N	118 31'08''W	U	P84			
850309	JBW0094		32 53'07''N	118 31'08''W	U	P84			
850310	CW00932		32 51'20''N	118 30'10''W	F	A			
850310	CW00933		32 51'25''N	118 30'10''W	F	A			
850310	CW00934		32 51'35''N	118 30'10''W	U	A			
850310	CW00935		32 51'53''N	118 30'16''W	U	P84			
850310	JBW0095		32 51'30''N	118 30'00''W	F	A			
850310	JBW0096		32 52'13''N	118 30'25''W	U	P83			
850607	JBW0097		32 53'22''N	118 31'12''W	F	A			
850608			32 53'07''N	118 31'04''W	U	PRE			
850608			32 53'07''N	118 31'04''W	U	PRE			
850608	JBW0098		32 52'57''N	118 30'48''W	U	PRE			
850609	JBW0099		32 48'50''N	118 24'10''W	M	A			
850609	JBW0100		32 49'30''N	118 23'00''W	F	A		YES	YES
850802	CW00936		32 53'10''N	118 31'07''W	F	J			

[1] SPECIES: M=Northern elephant seal (Mirounga angustirostris)
Z=California sea lion (Zalophus californianus)
P=Harbor seal (Phoca vitulina richardsi)

[2] SEX: M=Male; F=Female; U=Unknown

[3] AGE CLASS: P83=Pup of 1983; P84=Pup of 1984; P85=Pup of 1985
Y=Yearling; J=Juvenile;
SA=Subadult; A=Adult; U=Unknown; PRE=Premature

Appendix 1. continued

DATE	SPECIMEN NUMBER	SPECIES[1]	LATITUDE	LONGITUDE	SEX[2]	AGE CLASS[3]	TAGS PRESENT	SPECIMEN PARTS COLLECTED TEETH ?	SPECIMEN PARTS COLLECTED SKULL ?
850802	CWO0937		32 53'31''N	118 31'21''W	U	P85			
850803	CWO0938		32 53'07''N	118 31'08''W	U	P85			
850803	CWO0939		32 53'07''N	118 31'08''W	U	P85			
850803	CWO0940		32 53'07''N	118 31'04''W	U	P85			
850803	CWO0941		32 53'07''N	118 31'04''W	U	P84			
850803	CWO0942		32 53'07''N	118 31'04''W	U	P85			
850803	CWO0943		32 53'07''N	118 31'04''W	U	P85			
850804	CWO0944		32 51'08''N	118 29'58''W	U	P85			
850804	CWO0945		32 51'08''N	118 29'58''W	U	SA			
850804	CWO0946		32 51'08''N	118 29'58''W	M	A			
850804	CWO0947		32 51'08''N	118 29'58''W	U	J			
850906	JBW0101		32 53'07''N	118 31'08''W	U	P85			
850906	JBW0102		32 53'07''N	118 31'04''W	U	P85			
850907	JBW0103		32 53'07''N	118 31'04''W	U	P85			
850907	JBW0104		32 53'07''N	118 31'04''W	U	P85			
850908	JBW0105		32 53'10''N	118 31'07''W	M	P85	YES		
850908	JBW0106		32 53'10''N	118 31'07''W	U	P84			
850908	JBW0107		32 53'10''N	118 31'07''W	U	P85			
850908	JBW0108		32 53'10''N	118 31'07''W	U	P85			
850908	JBW0109		32 53'10''N	118 31'07''W	U	P85			

Appendix 2. White tags applied to Northern elephant seals on San Clemente Island duing 1985.

ANIMAL ID	DATE (YR/MO/DAY)	LOCAL TIME	LEFT FLIPPER TAG NUMBER	RIGHT FLIPPER TAG NUMBER	SEX	AGE CLASS P=PUP Y=YEARLING J=JUVENILE S=SUBADULT A=ADULT	ANIMAL CONDITION G=GOOD F=FAIR P=POOR
518	85/03/09	1230	518	518	M	P	G
519	85/03/09	1230	519	519	M	Y	P
520	85/03/09	1630	520	520	M	P	G
521	85/03/10	1000	521			Y	P
642	85/09/08	1124	642			Y	G

Appendix 3. White tags applied to California sea lions on San Clemente Island during 1985.

ANIMAL ID	DATE (YR/MO/DAY)	LOCAL TIME	LEFT FLIPPER TAG NUMBER	RIGHT FLIPPER TAG NUMBER	SEX	AGE CLASS P=PUP Y=YEARLING J=JUVENILE S=SUBADULT A=ADULT	ANIMAL CONDITION G=GOOD F=FAIR P=POOR	ANIMAL WEIGHT (KG)
522	85/09/07	805	522	522	M	P	G	21.3
523	85/09/07		523	523	M	P	G	22.2
524	85/09/07		524	524	F	P	G	15.4
525	85/09/07		525	525	M	P	G	19.5
526	85/09/07		526	526	M	P	P	9.5
527	85/09/07		527	527	M	P	G	21.7
528	85/09/07		528	528	M	P	G	27.2
529	85/09/07	835	529	529	M	P	G	19.0
530	85/09/07	848	530	530	M	P	G	22.6
532	85/09/07		532	532	F	P	G	14.9
533	85/09/07		533	533	F	P	G	14.5
534	85/09/07		534	534	F	P	G	20.4
535	85/09/07		535	535	M	P	G	24.5
536	85/09/07		536	536	F	P	G	15.4
537	85/09/07		537	537	F	P	G	16.3
538	85/09/07		538	538	F	P	G	17.2
539	85/09/07		539	539	M	P	G	15.4
540	85/09/07		540	540	M	P	G	24.9
541	85/09/07		541	541	F	P	G	20.8
542	85/09/07		542	542	F	P	G	18.6
543	85/09/07		543	543	M	P	G	20.8
544	85/09/07		544	544	F	P	G	18.6
545	85/09/07		545	545	M	P	G	24.5
546	85/09/07		546	546	M	P	G	19.0
547	85/09/07		547	547	F	P	G	20.4
548	85/09/07		548	548	F	P	G	15.9
549	85/09/07		549	549	M	P	G	23.6
550	85/09/07		550	550	F	P	G	19.9
551	85/09/07		551	551	M	P	G	21.7
552	85/09/07		552	552	F	P	G	18.6
553	85/09/07		553	553	M	P	G	23.1
554	85/09/07		554	554	M	P	G	24.9
555	85/09/07		555	555	F	P	G	18.6
556	85/09/07		556	556	F	P	G	19.9
557	85/09/07	950	557	557	M	P	G	23.6
558	85/09/07	1110	558	558	M	P	G	23.1
559	85/09/07		559	559	M	P	G	23.1
560	85/09/07		560	560	F	P	G	18.1
561	85/09/07		561	561	M	P	G	24.9
562	85/09/07		562	562	M	P	G	23.6
563	85/09/07		563	563	F	P	G	18.1
564	85/09/07		564	564	F	P	G	16.3
565	85/09/07		565	565	F	P	G	16.8

Appendix 3. Continued.

ANIMAL ID	DATE (YR/MO/DAY)	LOCAL TIME	LEFT FLIPPER TAG NUMBER	RIGHT FLIPPER TAG NUMBER	SEX	AGE CLASS P=PUP Y=YEARLING J=JUVENILE S=SUBADULT A=ADULT	ANIMAL CONDITION G=GOOD F=FAIR P=POOR	ANIMAL WEIGHT (KG)
566	85/09/07		566	566	F	P	G	19.5
567	85/09/07		567	567	M	P	G	19.5
568	85/09/07		568	568	M	P	G	18.1
569	85/09/07		569	569	M	P	G	25.8
570	85/09/07		570	570	M	P	G	25.4
571	85/09/07		571	571	F	P	G	19.9
572	85/09/07		572	572	M	P	G	18.1
573	85/09/07		573	573	M	P	G	15.9
574	85/09/07		574	574	M	P	G	18.6
575	85/09/07		575	575	M	P	G	13.6
576	85/09/07		576	576	M	P	G	21.3
577	85/09/07		577	577	F	P	G	15.9
578	85/09/07		578	578	M	P	G	22.6
579	85/09/07		579	579	F	P	G	
580	85/09/07		580	580	M	P	G	23.6
581	85/09/07		581	581	M	P	G	19.9
582	85/09/07		582	582	F	P	G	20.4
583	85/09/07		583	583	F	P	G	18.1
584	85/09/07		584	584	F	P	G	15.9
585	85/09/07		585	585	F	P	G	19.0
587	85/09/07		587	587	F	P	G	15.4
588	85/09/07		588	588	M	P	G	18.1
589	85/09/07		589	589	M	P	G	26.3
590	85/09/07		590	590	F	P	G	17.7
591	85/09/07		591	591	M	P	G	21.3
592	85/09/07		592	592	M	P	G	21.3
593	85/09/07		593	593	M	P	G	22.2
594	85/09/07		594	594	M	P	G	21.3
595	85/09/07		595	595	M	P	G	25.8
596	85/09/07		596	596	M	P	G	20.4
597	85/09/07		597	597	M	P	G	27.2
598	85/09/07		598	598	M	P	G	25.8
599	85/09/07		599	599	F	P	G	19.0
600	85/09/07		600	600	M	P	G	19.5
601	85/09/07		601	601	F	P	G	23.6
602	85/09/07		602	602	M	P	G	20.8
603	85/09/07		603	603	M	P	G	23.1
604	85/09/07		604	604	F	P	G	22.6
605	85/09/07		605	605	M	P	G	24.9
607	85/09/07	1329	607	607	M	P	G	21.7
608	85/09/07	1525	608	608	M	P	G	19.0
609	85/09/07		609	609	F	P	G	14.9
610	85/09/07		610	610	M	P	G	22.6
611	85/09/07	1535	611	611	M	P	G	23.6

Appendix 3. Continued.

ANIMAL ID	DATE (YR/MO/DAY)	LOCAL TIME	LEFT FLIPPER TAG NUMBER	RIGHT FLIPPER TAG NUMBER	SEX	AGE CLASS P=PUP Y=YEARLING J=JUVENILE S=SUBADULT A=ADULT	ANIMAL CONDITION G=GOOD F=FAIR P=POOR	ANIMAL WEIGHT (KG)
612	85/09/07	1545	612	612	F	P	G	17.7
613	85/09/07		613	613	M	P	G	21.3
614	85/09/07		614	614	F	P	G	16.3
615	85/09/07		615	615	F	P	G	17.7
616	85/09/07		616	616	M	P	G	16.8
617	85/09/07	1555	617	617	F	P	G	16.8
618	85/09/08	945	618	618	M	P	G	19.9
619	85/09/08		619	619	F	P	G	18.6
620	85/09/08		620	620	F	P	G	19.9
621	85/09/08		621	621	F	P	G	18.6
622	85/09/08		622	622	M	P	G	23.6
623	85/09/08		623	623	F	P	G	16.8
624	85/09/08		624	624	M	P	G	22.6
625	85/09/08		625	625	F	P	G	19.5
626	85/09/08		626	626	M	P	G	24.5
627	85/09/08		627	627	F	P	G	18.6
628	85/09/08		628	628	M	P	G	24.0
629	85/09/08		629	629	M	P	G	22.6
630	85/09/08		630	630	M	P	G	20.4
631	85/09/08		631	631	F	P	G	20.4
632	85/09/08		632	632	F	P	G	22.6
633	85/09/08		633	633	F	P	G	14.5
634	85/09/08		634	634	M	P	G	24.0
635	85/09/08		635	635	F	P	G	19.5
636	85/09/08		636	636	F	P	G	18.1
637	85/09/08		637	637	M	P	G	26.7
638	85/09/08		638	638	M	P	G	23.6
639	85/09/08		639	639	M	P	G	21.7
640	85/09/08		640	640	F	P	G	19.5
641	85/09/08	1100	641	641	F	P	G	18.6
643	85/09/08	1220	643	643	M	P	F	14.5
644	85/09/08		644	644	M	P	G	20.4
645	85/09/08		645	645	F	P	G	14.5
646	85/09/08		646	646	F	P	G	17.7
647	85/09/08	1232	647	647	F	P	G	15.9
648	85/09/08	1244	648	648	M	P	G	19.9
649	85/09/08		649	649	F	P	G	15.9
650	85/09/08	1255	650	650	F	P	G	17.7
651	85/09/08		651	651	M	P	G	19.9
652	85/09/08	1305	652	652	F	P	G	20.8
653	85/09/08		653	653	M	P	G	27.2
654	85/09/08		654	654	F	P	G	19.5
655	85/09/08		655	655	M	P	G	18.6
656	85/09/08	1315	656	656	M	P	G	20.8

Appendix 3. Continued.

ANIMAL ID	DATE (YR/MO/DAY)	LOCAL TIME	LEFT FLIPPER TAG NUMBER	RIGHT FLIPPER TAG NUMBER	SEX	AGE CLASS P=PUP Y=YEARLING J=JUVENILE S=SUBADULT A=ADULT	ANIMAL CONDITION G=GOOD F=FAIR P=POOR	ANIMAL WEIGHT (KG)
657	85/09/08	1337	657	657	M	P	G	22.6